Some Characteristics of the Polarization of Fluorescence of Porphyrines

S/020/60/133/003/026/031/XX
B019/B067

curve 1 represents the absorption spectrum, curve 2 the luminescence spectrum, curve 3 the degree of polarization as a function of wavelength, and curves 4 and 5 the polarization spectra of the first two luminescence bands. These results are discussed on the basis of the ordinary theory of polarized luminescence, and it is stated that the results may be satisfactorily explained only for highly hypothetical additional conditions. The authors mention another interpretation of the results for which they assume that the superposition of not perfectly symmetric oscillations causes a great change in the oscillator properties. It is usually assumed that in the electron spectra of polyatomic molecules mainly symmetric vibrations occur; in this case the oscillator maintains its direction. This assumption is related to the neglect of the dependence of the matrix elements of the dipole transition moment on the nuclear coordinates. The authors demonstrate that unsymmetrical vibrations may occur by taking account of this dependence. They thank M. G. Gurevich for having synthetized the compounds investigated, and M. A. Yel'yashevich and B. I. Stepanov, Academicians of the AS BSSR, for a discussion. There are 2 figures and 8 references: 5 Soviet, 2 US, and 1 German

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Some Characteristics of the Polarization of Fluorescence of Porphyrines

S/020/60/133/003/026/031/XX
B019/B067

ASSOCIATION: Institut fiziki Akademii nauk BSSR (Institute of Physics of the Academy of Sciences BSSR)

SUBMITTED: April 19, 1960

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S/020/60/133/003/026/C31/XX
B019/B067

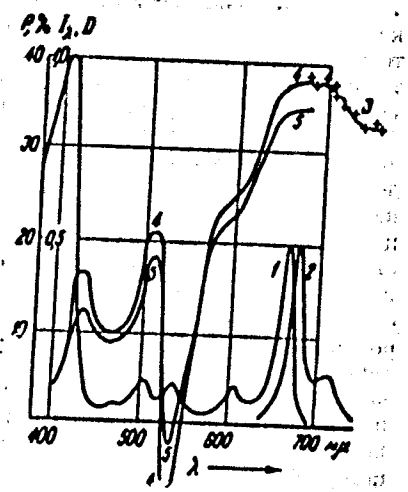


Рис. 1. Спектр поглощения (*1*), люминесценции (*2*) и зависимость степени поляризации от длины волны испускания (*3*), а также поляризационные спектры для первой (*4*) и второй (*5*) полос люминесценции протопорфирина в касторовом масле

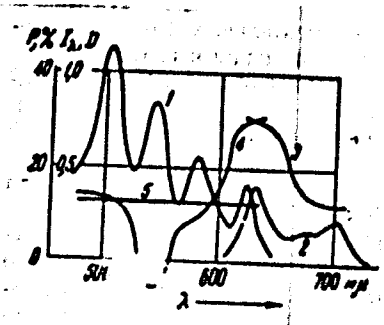


Рис. 2. То же, что на рис. 1, для феофитина а

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S/058/62/000/003/047/092
A061/A101

AUTHORS: Gurevich, M. O., Solov'yev, K. N.

TITLE: The luminescence of rare-earth phthalocyanines

PERIODICAL: Referativnyy zhurnal, Fizika, no. 3, 1962, 43, abstract 3V323 ("Dokl. AN BSSR", 1961, v. 5, no. 7, 291 - 294)

TEXT: The spectral luminescence characteristics of complex compounds synthesized by the authors from rare-earth elements and phthalocyanine were examined with respect to the problem of intramolecular transfer of the excitation energy from the organic constituent of the molecule to the rare-earth ion. Absorption and luminescence spectra of alcoholic Eu, Gd, and Yb phthalocyanine solutions have an appearance characteristic of ordinary metallic phthalocyanines. The position of the longwave absorption band depends little on the nature of the metal, while the quantum yield of fluorescence depends on it considerably, and amounts to 15% for Eu phthalocyanine, 4% for Gd phthalocyanine, and to less than 1% for Yb phthalocyanine. The temperature drop to -196°C merely narrows the fluorescence bands of rare-earth phthalocyanines. No lines of rare-earth ions appear in the spectra. Fluorescence is absent in emission spectra (in the 600 - 1,000 mμ region).

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S/058/62/000/003/047/092
A061/A101

The luminescence of rare-earth phthalocyanines

Conclusions: 1) The introduction of the paramagnetic ion into the molecule suggests the probability of singlet-triplet transitions as a result of spin-orbital interaction; 2) the triplet state in rare-earth phthalocyanines is of very low energy ($< 10{,}000\ cm^{-1}$), and phosphorescence lies beyond the sensitivity range of the instrument. As for Eu-Gd phthalocyanines, the excitation level of the rare earth is higher than the first singlet excitation level of $\pi$-electrons of the phthalocyanine ring. Therefore, there are no rare-earth lines in the fluorescence spectrum due to transitions from the low singlet level. The low quantum yield of fluorescence is related to the radiationless singlet-triplet transitions, the probability of which is greater in Gd phthalocyanine because of the large magnetic moment in the Gd ion. As regards Yb phthalocyanine, the rare-earth level is lower than the excited singlet $\pi$-level, but is higher than the first triplet level. The extremely low quantum yield of Yb-phthalocyanine fluorescence ($< 1\%$) is ascribed by the authors to the energy transfer from the porphin ring to the Yb ion and the subsequent radiationless transitions to the triplet state of the molecule.

R. Personov

[Abstracter's note: Complete translation]

Card 2/2

SOLOV'YEV, K.N.

Interpretation of the electron spectra of porphyrins on symmetry grounds. Opt. i spektr. 10 no.737-744 Je '61. (MIRA 14:8)

(Porphyrins--Spectra)

GURINOVICH, G.P.; SEVCHENKO, A.N.; SOLOV'YEV, K.N.

Maximum polarization of the fluorescence of porphyrins. (MIRA 14:8)
Opt. i spektr. 10 no.6:750-758 Je '61.
(Polarization (Light)) (Fluorescence)
(Porphyrins--Spectra)

YEL'YASHEVICH, M.A.; GURINOVICH, G.P.; SOLOV'YEV, K.N.

Awarding of the S.I.Vavilov Gold Medal. Usp.fiz.nauk 75 no.2:389-390 O '61. (MIRA 14:10)
(Medals)

SOLOV'YEV, K.N. [Salaujou,K.M.]

Spectral-luminescent properties of porphine derivatives. Vestsi AN BSSR. Ser. fiz.-tekh. nav. no.3:27-38 '62. (MIRA 18:3)

GODNEV, Tikhon Nikolayevich. Prinimal uchastiye SOLOV'YEV, K.N.; MANINA, L., red. izd-va; VOLOKHANOVICH, I., tekhn. red.

[Chlorophyll; its structure and formation in plants] Khlorofill; ego stroenie i obrazovanie v rastenii. Minsk, Izd-vo AN BSSR, 1963. 318 p. (MIRA 16:8)
(Chlorophyll)

GURINOVICH, G. P.[Hurynovich, H. P.]; PIKULIK, L. G.[Pikulik, L. H.]; SOLOV'YEV, K. M.[Salauiou, K. M.]

Anton Nikifaravich Seuchanka; on his 60th birthday. Vestsi AN BSSR. Ser. fiz.-tekh. nav. no.1:124-128 '63. (MIRA 16:4)

(Seuchanka, Anton Nikifaravich, 1903-)

EWP(j)/EPF(c)/EWT(m)/BDS ASD Pc-4/Pr-4 RM/WW
L 10773-63
ACCESSION NR: AP3002797 S/0051/63/014/006/0835/0838

AUTHOR: Gurinovich, G. P.; Zhevandrov, N. D.; Solov'yev, K. N.

TITLE: 11th Conference on Luminescence [Held at Minsk, 10—15 September 1962]

SOURCE: Optika i spektroskopiya, v. 14, no. 6, 1963, 835-838

TOPIC TAGS: molecular luminescence, stimulated emission, triplet state, laser

ABSTRACT: The XI soveshchaniye po lyuminestsentsii (11th Conference on Luminescence), was attended by more than 370 Soviet scientists. More than 180 papers were presented. The following list indicates the areas of principal emphasis among the papers presented and the personalities associated with each area. I. STIMULATED EMISSION: dependence of absorption, scattering, and photoluminescence on the parameters of incident nonmonochromatic radiation and on nonradiative transitions (P. A. Apanasevich); conditions for

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coherent spontaneous emission (P. A. Apanasevich and G. S. Kruglik); induced anisotropy of the absorption factor at high intensities (V. P. Gribkovskiy); transfer and Maxwell equations solved for the absence of external radiation (B. I. Stepanov); effect of noise on generation of a plane-parallel layer (B. I. Stepanov, A. M. Samson, and Yu. I. Chekalinskaya); autoluminescence of a stack of plane-parallel plates with positive and negative absorption factors (A. P. Khapalyuk); effect of active substances inside a cavity on the radiation generated (B. I. Stepanov, A. M. Samson, and V. P. Gribkovskiy); proof of feasibility of using molecular crystals for lasers (M. S. Soskin); ruby laser kinetics (M. D. Galanin); neodymium-doped glass laser kinetics (P. P. Feofilov). II. MOLECULAR LUMINESCENCE THEORY: similarity between the Shpol'skiy effect, electron-vibrational transfer in impurity centers of ionic crystals, and the Mossbauer effect (K. K. Rebane and V. V. Khizhnyakov); diffusion quenching of fluorescence by additives (B. Ya. Sveshnikov); generalized theory of luminescence quenching by additives (A. M. Samson); classical linear oscillator model and resonance transformation of light by molecules (P. P. Shory*gin and L. L. Krushinskiy); thermodynamics of photoluminescence

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(Yu. T. Mazurenko); energy migration in two-component mixtures (V. S. Rubanov). III. LUMINESCENCE OF MOLECULAR CRYSTALS: pronounced temperature dependence of band half-width in exciton luminescence (V. L. Broude, Ye. F. Sheka, and M. T. Shpak); experimental studies of absorption spectra with deuterium-substituted naphthalene (Ye. F. Sheka); direct transition from the exciton zone in the luminescence spectrum of benzene (M. T. Shpak and others); impurity line spectra as indicators of crystal phase transformations (V. N. Vatulev); polarization changes in the short-wave spectrum of stilbene (V. I. Gribkov, N. D. Zhevandrov, and Ye. I. Chebotareva); qualitative applicability of the phenomenological theory of exciton diffusion motion to anthracene crystals with naphthacene impurities (V. L. Zima, V. M. Korsunskiy, and A. N. Faydy*sh); discovery of intermediate local states in doped molecular crystals (V. P. Kovalev, Yu. V. Naboykin, and others); and triplet state of molecular crystals (Naboykin and others). IV. QUASI-LINE SPECTRA: multiplet electron-vibrational spectra in frozen n-paraffin solutions at 77K to melting point (E. V. Shpol'skiy); dibenzylaminoethylene as a solvent in luminescence spectroscopy of perilene and "defectene"

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ACCESSION NR: AP3002797

(M. M. Val'dman and G. D. Sheremet'yev); use of isoparaffin to produce sharp spectra of alpha- and beta-methylnaphthalenes/(V. L. Levshin and Kh. I. Mamedov); fluorescence and absorption spectra of nonmetallic phthalocyanine/in n-paraffins (R. I. Personov); fluorescence and absorption spectra of pyrene in n-paraffins (L. A. Klimovaya); and phosphorescence spectrum of phenanthrene/in paraffins (P. A. Teplyakov). V. YIELD AND QUENCHING OF LUMINESCENCE IN SOLUTIONS: nonradiative luminescence deactivation as a function of spectral position (V. V. Zelinskiy); nonradiative deactivation of the triplet state of excited aromatic molecules in glasslike solutions (V. L. Yermolayev); absence of Stokes cutoff (G. P. Gurinovich, Ye. K. Kruglik, and A. N. Sevchenko); and new fluorometric device with modulating frequencies of 11.2 and 131 Mc (V. I. Shirokovoy).

ASSOCIATION: none

SUBMITTED: 00 DATE ACQ: 15Jul63 ENCL: 00

SUB CODE: 00 NO REF SOV: 000 OTHER: 000

/For Complete Set See: 11th Conference on Luminescence/

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EWP(j)/EPF(c)/EW ' )/BDS ASD Pc-4/Pr-4 RM/WW

L 10773-63 S/0051/63/014/006/0835/0838

110
63

ACCESSION NR: AP3002797

AUTHOR: Gurinovich, G. P.; Zhevandrov, N. D.; Solov'yev, K. N.

TITLE: 11th Conference on Luminescence /Held at Minsk, 10—15 September 1962/

SOURCE: Optika i spektroskopiya, v. 14, no. 6, 1963, 835-838

TOPIC TAGS: molecular luminescence, stimulated emission, triplet state, laser

ABSTRACT: VI. LUMINESCENCE OF ORGANIC VAPORS: excited states in the gas phase (N. A. Borisevich); vapors of molecules with a structured spectrum (V. V. Gruzinskiy); temperature dependence of spectra of complex molecules and the relationship between the absorption factor and the average effective excitation energy (V. A. Tolkachev); effect of temperature on the quantum yield of the luminescence of organic vapors (V. P. Klochkov);

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and gas-phase study of methyl and ethyl derivatives of phthalimide (V. T. Korotkevich). VII. EFFECT OF MOLECULAR ASSOCIATION, SOLVENT PROPERTIES, ETC. ON LUMINESCENCE: concentration quenching of luminescence of solutions and the role of molecular association (V. L. Levshin); role of energy migration to nonluminescent-associated molecules in concentration quenching (B. Ya. Sveshnikov); concentration effects due to molecular association and solvent action (V. L. Levshin and V. G. Bocharov); method of calculating relative number of associative aggregates (A. S. Selivanenko and M. V. Fok); development of association in the course of concentration quenching (V. L. Levshin and Ye. G. Baranova); features of dimer luminescence of acridine orange and rhodamine B (Yu. V. Morozov); quantitative interpretation of temperature dependence of luminescence (O. P. Kharitonovaya, I. V. Piterskaya, and N. G. Bakhshiyev); effect of temperature on spectral-luminescence characteristics of complex molecules (L. F. Gladchenko and L. G. Pikulik); and light-induced orientation of molecules (B. S. Neporent and O. V. Stolbovaya). VIII. TRIPLET STATES: EPR and luminescence study of triplet states of molecules (A. K. Piskunov,

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R. N. Nurmukhametov, and D. N. Shigorin); induction-resonance energy transfer from aromatic molecules in the triplet state (V. L. Yermolayev and Ye. B. Sveshnikova); new method of determining probability of transition of molecules from the fluorescent to the phosphorescent state (A. V. Aristov and B. Ya. Sveshnikov); application of pulse spectroscopy methods to porphyrins (G. P. Gurinovich and A. I. Patsko); absorption spectra of excited organophosphors (V. A. Pilipovich and N. I. Tursunov); and development of phosphorescence in narrow-spectrum regions (M. D. Khalupovskiy). IX. MOLECULAR LUMINESCENCE OF INORGANIC COMPOUNDS: concentration dependence of intensity of luminescence lines in the ruby (N. A. Tolstoy and A. P. Abramov); mercurylike centers in ionic crystals as an intermediate case between free ions and solutions of complex molecules (N. Ye. Lushchik and Ch. B. Lushchika); luminescence of sodium nitrate at low temperatures (A. F. Yatsenko and Yu. A. Kulyupin); optical and photochemical properties of $PbI_2$ crystals (I. S. Gorban' and V. M. Kosarev); luminescence of crystals and solutions of Li, K, Ng, and Ba platinocyanides (A. M. Tkachuk); separate reports on spectral characteristics of aqueous solutions of colloidal salts of

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As, Ga, Se, Pb, and Bi (M. U. Bely*y, I. Ya. Kushnirenko, and B. A. Okhrimenko); temperature dependence of absorption and fluorescence spectra of uranyl compounds (A. N. Sevchenko, L. V. Volod'ko, and D. S. Umreyko); luminescence of Cr ions in glass, and effect of $Cr^{3+}$ ions on the luminescence spectra of $Cr^{3+}$ (G. O. Karapetyan, S. G. Lunter, and D. M. Yudin); luminescence of rare-earth ions in glass (G. O. Karapetyan); luminescence of solutions and crystals of rare-earth complexes (A. N. Sevchenko, V. V. Kuznetsovaya, and V. S. Khomenko); and luminescence of uranyl cations in a complex with phthalocyanine (G. N. Lyamin and G. I. Kobyshev). Reports also dealt with such areas as photosynthesizing pigments, protein systems, the application of spectral-luminescence methods to biological problems, and the relation between luminescence and molecular structure.

For Complete Set See: 11th Conference on Luminescence III

Set 2/2, Card 4/4

SOLOV'YEV, K.N.; SHKIRMAN, S.F.; KACHURA, T.F.

Spectral-luminescent properties of benzopurpurins. Izv. AN SSSR. Ser. fiz. 27 no.6:767-771 Je '63. (MIRA 16:7)

1. Institut fiziki AN Belorusskoy SSR.
(Benzopurpurin--Spectra)

S/053/63/079/002/001/004
B102/B186

AUTHORS: Gurinovich, G. P., Sevchenko, A. N., Solov'yev, K. N.

TITLE: Spectroscopy of porphyrins

PERIODICAL: Uspekhi fizicheskikh nauk, v. 79, no. 2, 1963, 173 - 234

TEXT: The present review article covers the published literature from 1933 to 1961. The chapters are as follows: (1) Introduction; (2) Chemical structure of the porphyrin molecules; (3) IR spectra of the porphyrins and problems of the molecule structure; (4) The electron spectra (absorption spectra, mirror symmetry of absorption and emission spectra, external effects on the spectra, effect of the pH of the solution, effect of the metal in the case of metal porphyrins, transitions with the participation of metastable states); (5) Quantum yield and luminescence period; (6) Polarized fluorescence of porphyrin derivatives (maximum polarization and the symmetry in the molecule structure, polarization spectra and the oscillator model of the porphyrin molecule); (7) Interpretation of the electron spectra (theory, experiments, interpretation of the vibrational spectra); (8) Spectroscopy of the associated forms of the porphyrin molecules; (9) Paramagnetic resonance. There are 27 figures and

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Spectroscopy of porphyrins

S/053/63/079/002/001/004
B102/B186

193 references.

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L 19952-63 EWA(k)/EWP(k)/EWP(q)/EWT(m)/BDS/T-2/EEC(b)-2/ES(t)-2--AFFTC/ASD/ESD-3/RADC/APGC/AFWL/IJP(C)/JW2--Pf-4/Pi-4/Pq-4--GG/WH/JHB/WG/K

ACCESSION NR: AP3006795 S/0053/63/080/004/0685/0701

AUTHOR: Gurinovich, G. P.; Zhevandrov, N. D.; Solov"yev, K. N.

TITLE: 11th Conference on Luminescence (Molecular luminescence and luminescence analysis) [Minsk, 10-15 Sep 1962]

SOURCE: Uspekhi fizicheskikh nauk, v. 80, no. 4, 1963, 685-701

TOPIC TAGS: laser research, laser resonant cavity, luminescence, inorganic laser material, luminescence conference, laser oscillation condition, molecular crystal laser, ruby laser, glass neodymium laser, Mossbauer effect, organic laser material, triplet state, chlorophyll luminescence, albumen luminescence, luminescence research

ABSTRACT: The XI Soveshchaniye po lyuminestsentsii (11th Conference on Luminescence) was held 10-15 September 1962 in Minsk. More than 370 participants took part, and more than 180 reports were presented. Considerable attention was paid to lasers. A series of theoretical works concerning the properties of absorption and emission at high radiation intensities and the theory of

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a resonator in which an active substance is placed were presented by the Institut fiziki AN BSSR (Institute of Physics, AN BSSR). P. A. Apanasevich in his report on the dependence of absorption, emission, and scattering of radiation on the intensity of incident radiation gave the derivation by the method of quantum electrodynamics of the dependence of absorption and dependence of scattering and photo-luminescence characteristics on the spectral composition and intensity of incident nonmonochromatic radiation absorbed by the medium and on the probability of nonoptical transitions. In the report of G. S. Kruglik and P. A. Apanasevich on the problem of coherent spontaneous emission, the conditions under which coherent spontaneous emission with an intensity proportional to the square of the number of emitted particles were discussed, and it was shown that under general conditions such emission is impossible. The report of V. P. Gribkovskiy on forced anisotropy of the absorption coefficient was devoted to properties of the absorption coefficient at high intensities, and it was shown that the absorption coefficients of a linearly polarized or a natural light coincide with absorption coefficients of isotropic radiation

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only at low or very high intensities. The report of B. I. Stepanov and coworkers on the oscillation of an inorganic plane-parallel layer dealt with the theory of laser resonators. Results of the solution of transport equations and Maxwell equations for inorganic layers with a negative absorption coefficient in the absence of outside radiation were given. The conditions for a stationary oscillation were obtained; by calculating the nonlinear dependence of the absorption coefficient on the radiation density, the values for density and energy release inside the layer under conditions of stationary oscillation were determined. The conditions for flows of different directions and frequencies were investigated. In the work of B. I. Stepanov, A. M. Samson, and Yu. I. Chekalinskaya on the effect of noises on the oscillation of a bounded plane-parallel layer, the light field inside and outside the resonator in the presence of noises was discussed. In the report of Khapalyuk on the possibility of generation of radiation by a system of plane-parallel plates, self-luminescence of a pile of plane-parallel plates with positive as well as negative absorption coefficients was analyzed. The report of B. I. Stepanov, A. M.

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Samson, and V. P. Gribkovskiy on the effect of characteristics of a substance on the properties of generated radiation was concerned with properties of an active substance inside the resonator. The pump power, absorption, luminescence, and the power and oscillation threshold of a plane-parallel layer with three energy levels were calculated. In the work of V. L. Broude, V. S. Mashkevich, A. F. Prikhot'ko, N. F. Prokopyuk, and M. S. Soskin on induced radiation in molecular crystals, a four-level scheme for a quantum generator was discussed. It was shown that optical properties of molecular crystals provide a basis for the realization of a quantum generator. In the report of A. M. Samson and V. A. Savva on nonstationary luminescence of an oscillating plane-parallel layer, laser luminescence kinetics were discussed. In the report of M. D. Galinin, A. M. Leontovich, E. A. Sviridenkov, V. N. Smorchkov, and Z. A. Chizhikova on radiation properties of a ruby crystal laser, the kinetics of generation at room temperature and low temperature (down to -165C) and properties of radiation coherence in a ruby laser were investigated. The report of A. M. Bonch-Bruyevich, V. V. Vargin, Ya. A. Imas, G. O. Karapetyan, Ya. E. Karis, M. N.

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Tolstoy, and P. P. Feofilov on luminescence and induced radiation of a glass activated by neodymium discussed absorption and luminescence spectra of glass containing 0.1—10% neodymium. Stimulated emission in the region of 1.06 μ, observed in specimens, was investigated at room and nitrogen temperatures. K. K. Rebane and V. V. Khizhnyakov in their report presented results from theoretical investigations of the Mössbauer effect. The authors succeeded in discovering an analogy between Shpol'skiy's effect, electron-vibrational transitions in impurity centers of ionic crystals, and the Mössbauer effect. A new version of the theory of diffusion quenching of fluorescence in a solution by means of foreign substances was offered in the report of B. Ya. Sveshnikov (deceased), A. S. Selivanenko, V. I. Shirokov, and L. A. Kiyanskaya. Other reports presented during the conference on molecular luminescence can be grouped as follows: theory of molecular luminescence; luminescence of molecular crystals; quasi-line spectra of frozen solutions; yield and quenching of luminescence of solutions; luminescence of vapors of organic compounds; the influence of the association of molecules,

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ACCESSION NR: AP3006795

the solvent, and other physicochemical factors on luminescence; triplet states; luminescence of chlorophyll, albumens, and other important biological compounds; molecular luminescence of inorganic compounds; and molecular luminescence and chemical problems (relationship between luminescence and molecular structure, chemiluminescence, etc.). Reports on luminescence analysis can be grouped as follows: luminescence analysis in chemistry; luminescence analysis in biology, medicine, microbiology, and veterinary medicine; luminescence analysis in technology, industry, and geology; and instruments and methods of luminescence analysis.

ASSOCIATION: none

SUBMITTED: 00 DATE ACQ: 30Sep63 ENCL: 00

SUB CODE: PH NO REF SOV: 000 OTHER: 000

Card 6/6

SEVCHENKO, A.N., akademik; SOLOV'YEV, K.N.; SHKIRMAN, S.F.; SARZHEVSKAYA, M.V.

Quasi-line electron vibration spectra of porphine and dihydroporphine. Dokl. AN SSSR 153 no.6:1391-1394 D '63. (MIRA 17:1)

1. Institut fiziki AN BSSR. 2. AN BSSR (for Sevchenko).

APANASEVICH, P.A.; BORISEVICH, N.A. VOLOD'KO, L.V.; GLADCHENKO, L.F.; GRIBKOVSKIY, V.P.; GURINOVICH, G.P.; IVANOV, A.P.; KUZNETSOVA, V.V.; PIKULIK, L.G.; PILIPOVICH, V.A.; RUBANOV, A.S.; RUBANOV, V.S.; SAMSON, A.M.; SARZHEVSKIY, A.M.; SOLOV'YEV, K.N.; UMREYKO, D.S.; KHAPALYUK, A.P.; YEL'YASHEVICH, M.A., akademik, red.

[Interaction between nonequilibrium radiation and matter] Vzaimodeistvie neravnovesnogo izlucheniia s veshchestvom. Minsk, Nauka i tekhnika, 1965. 223 p. (MIRA 18:3)

1. Akademiya nauk SSSR. Institut fiziki. Akademiya nauk Belorusskoy SSR (for Yel'yashevich).

L 49773-65

ACCESSION NR: AR5012244 UR/0058/65/000/003/D028/D028

15

B

SOURCE: Ref. zh. Fizika, Abs. 3D196

AUTHORS: Solov'yev, K. N.; Shkirman, S. F.; Sarzhevskaya, M. V.

TITLE: Quasilinear electronic spectra of porphin and its derivatives

CITED SOURCE: Tr. Komis. po spektroskopii. AN SSSR, vyp. 1, 1964, 634-647

TOPIC TAGS: absorption spectrum, luminescence spectrum, porphin, dihydroporphin, electronic spectrum, line spectrum

TRANSLATION: The quasilinear spectra of absorption and luminescence of porphin and hydroporphin (chlorin) and also some of their derivatives, were investigated in crystalline matrices of n-paraffins at 77K. The observed frequency differences are interpreted. Comparison of the spectra of the porphin and chlorin shows that the hydration of the double bond in one of the pyrrole rings does not affect adversely the sharpness of the lines. It is assumed that the absence of splitting in the spectra of chlorophyll is due to the fact that the system of extraneous substitutes is probably complicated by the presence of a phytol residue.

SUB CODE: GP, OC ENCL: 00

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L 8268-66 EWT(1)/ IJP(c) WW/GG

ACCESSION NR: AP5019756

UR/0051/65/019/002/0239/0241

535.51 : 535.373

AUTHOR: Gurinovich, G. P.; Patsko, A. I.; Solov'yev, K. N.; Shkirman, S. F.

TITLE: Polarization of the fluorescence of metalloporphyrins

SOURCE: Optika i spektroskopiya, v. 19, no. 2, 1965, 239-241

TOPIC TAGS: metal compound, fluorescence, light polarization, phosphorescence, intermolecular complex

ABSTRACT: The authors measured the limiting degree of polarization and the polarization spectra of zinc complexes of mesoporphyrin, octaethylporphine, tetraphenylporphine, tetrabenzoporphine, and copper complexes of mesophorphyrin and tetraphenylporphine. The zinc complexes exhibit both fluorescence and phosphorescence, the copper complexes only phosphorescence. The measurements were made with a double monochromator described previously (Izv. AN SSSR ser. fiz. v. 22, 1407, 1958) using rectangular vacuum cells immersed in liquid nitrogen in a quartz Dewar. The spectra are shown in Fig. 1 of the Enclosure. The results show that the degree of phosphorescence polarization is small and positive (~1/7) and does not depend on the excitation wavelength. The results are compared with other phosphorescence studies. The difference from the case of aromatic compounds is attributed to the

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ACCESSION NR: AP5019756

increased interaction between the singlet and triplet levels, due to the heavy metal in the metalloporphyrin molecule. The results also point to an interaction between the triplet ($\pi$, $\pi^*$) level with the singlet ($\pi$, $\pi^*$) level, probably with the first excited level. This interaction may also be the cause of the difference in the spectra and luminescence durations of the metalloporphyrins and aromatic compounds. Orig. art. has: 3 figures.

ASSOCIATION: none

SUBMITTED: 22Jul64 ENCL: 01 SUB CODE: OP

NR REF SOV: 006 OTHER: 004

Card 2/3

L 8263-66
ACCESSION NR: AP5019756

ENCLOSURE: 01

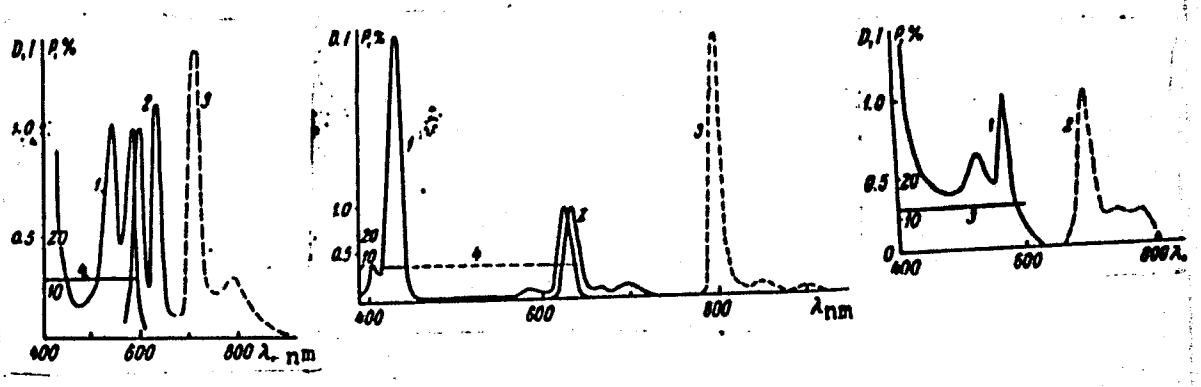


Fig. 1. Spectra of Zn mesoporphyrin (left), Zn tetrabenzoporphin (center), and Cu mesoporphyrin (right). 1 - Absorption spectrum, 2 -fluorescence spectrum, 3 - phosphorescence spectrum, 4 - polarization spectrum of phosphorescence.

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L 01257-66 EWT(1)/EWT(m)/EPF(c)/EWP(j)/EWA(c) IJP(c) RM
ACCESSION NR: AP5020803 UR/0048/65/029/008/1378/1381

AUTHOR: Shkirman, S. F.; Solov'yev, K. N.

TITLE: Quasi-line fluorescence spectra of tetrazaphyrin and tetrabenzoporphyrin /Report, 13th Conference on Luminescence held in Khar'kov 25 June to 1 July 1964/

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 29, no. 8, 1965, 1378-1381, and insert facing p. 1378

TOPIC TAGS: absorption spectrum, luminescence spectrum, line spectrum, vibration frequency, solution property

ABSTRACT: In this paper is reported a continuation of earlier work by the authors and collaborators (Dokl. AN SSSR. 153, 191, 1963) on quasi-line fluorescence spectra in unbranched hydrocarbon solvents at liquid nitrogen temperatures. The emission and absorption spectra of tetrazoporphyrin and tetrabenzoporphyrin in n-octane were recorded at 77°K. The tetrazoporphyrin was synthesized by the Linstead-Whalley method, and the tetrabenzoporphyrin by a modification of the Linstead-Weiss method in which a cadmium complex rather than a zinc complex was employed. The solutions in n-octane were obtained by dissolving the materials in more suitable solvents (chlorobenzene or a piridine-acetone mixture) and adding

Card 1/2

L 01257-66

ACCESSION NR: AP5020803

O

small quantities of these solutions to n-octane. Both the emission and absorption spectra of both materials were rich in lines and evinced a doublet structure. Many vibrational frequencies in both molecules were determined; these are tabulated and their identification is discussed. Some identifications were made difficult by violation of the mirror symmetry rules by tetrabenzoporphyrin; this difficulty was obviated by comparing the tetrabenzoporphyrin spectrum with the spectrum of zinc tetrabenzoporphyrin, which more nearly conformed to the symmetry rules. Orig. art. has: 3 figures and 3 tables.

ASSOCIATION: none

SUBMITTED: 00 ENCL: 00 SUB CODE: OP, OC

NO REF SOV: 003 OTHER: 002

Card 2/2

L 04310-65 EPF(c)/EWP(j)/EWA(c)/EWT(l)/EWT(m) IJP(c) RM

ACCESSION NR: AP5012763 UR/0020/65/161/006/1313/1316

AUTHOR: Sevchenko, A. N. (Academician AN BSSR); Solov'yev, K. N.; Shkirman, S. F.; Kachura, T. F.

TITLE: Quasi-linear electronic spectra of tetrabenzoporphin

SOURCE: AN SSSR. Doklady, v. 161, no. 6, 1965, 1313-1316

TOPIC TAGS: absorption spectrum, fluorescence spectrum, spectrum analysis, nonmetallic organic compound, electron transition

ABSTRACT: The authors investigate the quasi-linear absorption and fluorescence spectra of tetrabenzoporphin, from which a whole series of benzoporphins is derived. The tetrabenzoporphin was dissolved in chlorobenzene and small quantities of it were introduced into a hydrocarbon. The quasi-line spectra were photographed with a glass spectrograph ISP-51 with long-focus UF-84 camera. The spectrum was analyzed in detail and both differences and similarities of the room-temperature absorption spectra of tetrabenzoporphin and the porphyrins are discussed in detail. A table is presented of the frequencies of the normal oscillations of tetrabenzoporphin, based on the study of the quasi-line fluorescence and absorption spectra corresponding to four electronic transitions. The results are compared with those obtained by others. The causes of the peaks in the absorption band are explained. Some

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L 64310-65

ACCESSION NR: AP5012763

3

hypotheses concerning the nature of the multiplets in the spectra are advanced and it is suggested that in the present case the structure of the multiplet is determined only by the orientation of the electronic oscillator relative to the molecular axis. Orig. art. has: 2 figures and 1 table.

ASSOCIATION: Institut fiziki Akademii nauk BSSR (Institute of Physics, Academy of Sciences, BSSR) 44,55

SUBMITTED: 03Dec64 ENCL: 00 SUB CODE: OP

NR REF SOV: 004 OTHER: 002

KC

Card 2/2

SEVCHENKO, A.N., akademik; SOLOV'YEV, K.N.; [illegible], V.A.; SHKIRMAN, S.F.

Low-temperature polarization spectra of porphine and its derivatives. Dokl. AN SSSR 143 no.6:1371-1373 Ap '62. (MIRA 18:8)

1. Institut fiziki AN BSSR. 2. AN BSSR (for Sevchenko).

L 04642-67 EWT(m)/EWP(j) RM
ACC NR: AP6024410 SOURCE CODE: UR/0020/66/169/001/0077/0080

AUTHOR: Sevchenko, A. N. (Academician AN BSSR); Solov'yev, K. N.; Gradyushko, A. T.; Shkirman, S. F.

ORG: Institute of Physics, Academy of Sciences BSSR (Institut fiziki Akademii nauk BSSR)

TITLE: Quasiline electronic spectra of metal derivatives of tetrabenzoporphin and phthalocyanine

SOURCE: AN SSSR. Doklady, v. 169, no. 1, 1966, 77-80

TOPIC TAGS: electron spectrum, vibration spectrum, metallic organic derivative, phthalocyanine, spectral line, line intensity, molecular interaction

ABSTRACT: This research was motivated by the analogy between complex compounds of porphin derivatives with metals, on the one hand, and biological substances such as chlorophyll on the other. The authors succeeded in overcoming some of the earlier difficulties in the study of the fine structure of the electron-vibrational spectra of porphyrins, by creating conditions under which the quasiline spectra are sufficiently sharp to permit a vibrational analysis of the fluorescence absorption spectra. The procedure is similar to that used earlier for nonmetallic compounds (Izv. AN SSSR ser. fiz. v. 29, 1378, 1965 and earlier), n-octane being used as a host matrix for the investigated substance. The spectra were obtained with an ISP-51 spectrograph with a UF-84 camera. Detailed data on the spectra of tetrabenzoporphin, magnesium-

Card 1/2 UDC: 535.333

L 04642-67

ACC NR: AP6024410

tetravenzoporphin, zinc-tetrabenzoporphin, magnesium-phthalocyanide, zinc-phthalocyanide, and phthalocyanine, together with the frequencies of the resolved lines and their relative intensities, are given. The comparison of the metal-derivative spectra with the spectra of the free bases leads to the conclusion that the general character of the vibrational structure does not noticeably change upon introduction of the metal, and that most frequencies can be compared for both types of compounds, tetravenzoporphin and phthalocyanine, with the exception of the most active frequencies. The changes of the corresponding vibrations in the series free base - magnesium - zinc are analogous for both the tetrabenzoporphin and phthalocyanine, showing a similar influence of the metal atom on the dynamics of the molecule in both cases. The authors thank T. F. Kachura for preparing the investigated compounds. Orig..art. has: 2 figures and 2 tables.

SUB CODE: 20/ SUBM DATE: 24Feb66/ ORIG REF: 007/ OTH REF: 002

awm
Card 2/2

SOLOV'YEV, K.N., inzh.

Ways of lowering the cost of mechanized peat transfer. Torf. prom. 38 no.2:22-25 '61. (MIRA 14:3)

1. Lengiprotorf.
(Peat—Transportation)

KOZLOV, V.P., dotsent, kand.tekhn.nauk; SOLOV'YEV, K.P., assistent

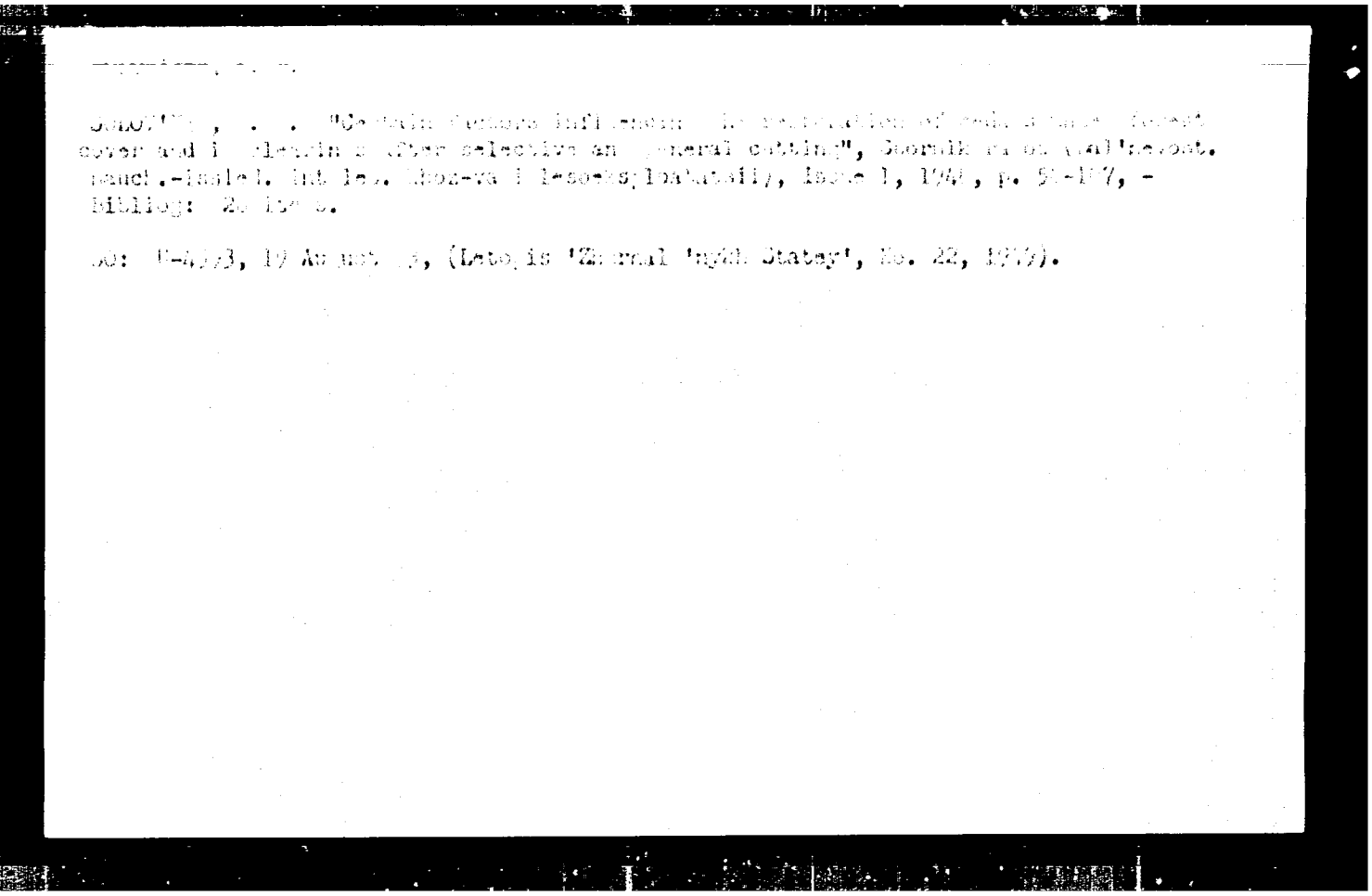
Characteristics of work done with the comparator at the Department Geodesy during the period 1952-1959. Trudy MIIGAIK no.44:65-76 '61. (MIRA 14:7)

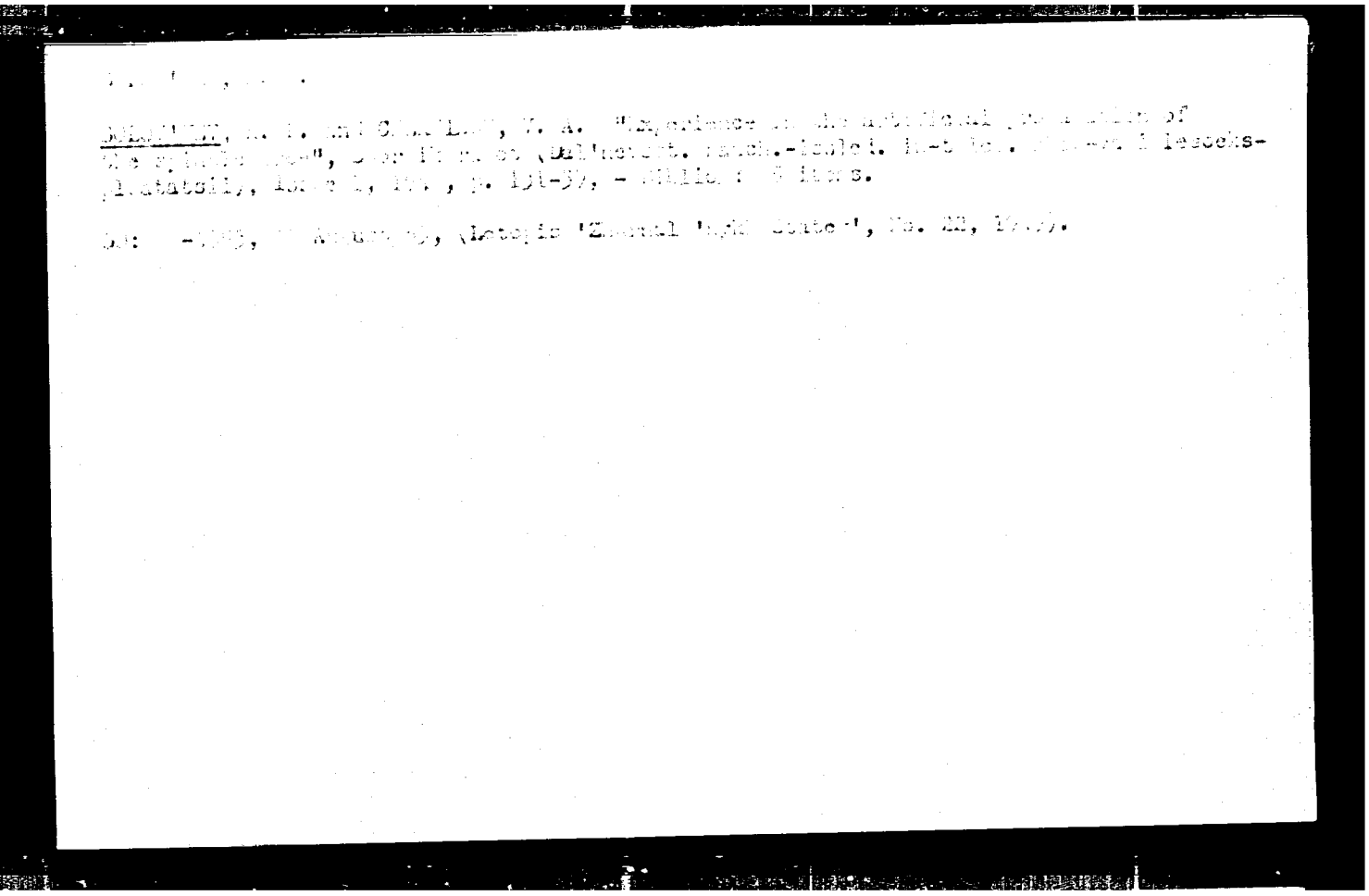
1. Moskovskiy institut inzhenerov geodezii, aerofotos"yemki i kartografii, kafedra geodezii.
(Measuri: tapes--Standards)

SOLOV'YEV, K.P., glavnyy veterinarnyy vrach Kologrivskogo rayona, Kostromskoy oblasti

Pincers for holding swine. Veterinariia 33 no.8:33 Ag '56. (MLRA 9:9)

(Veterinary instruments and apparatus)





[redacted]

[redacted]

[redacted]

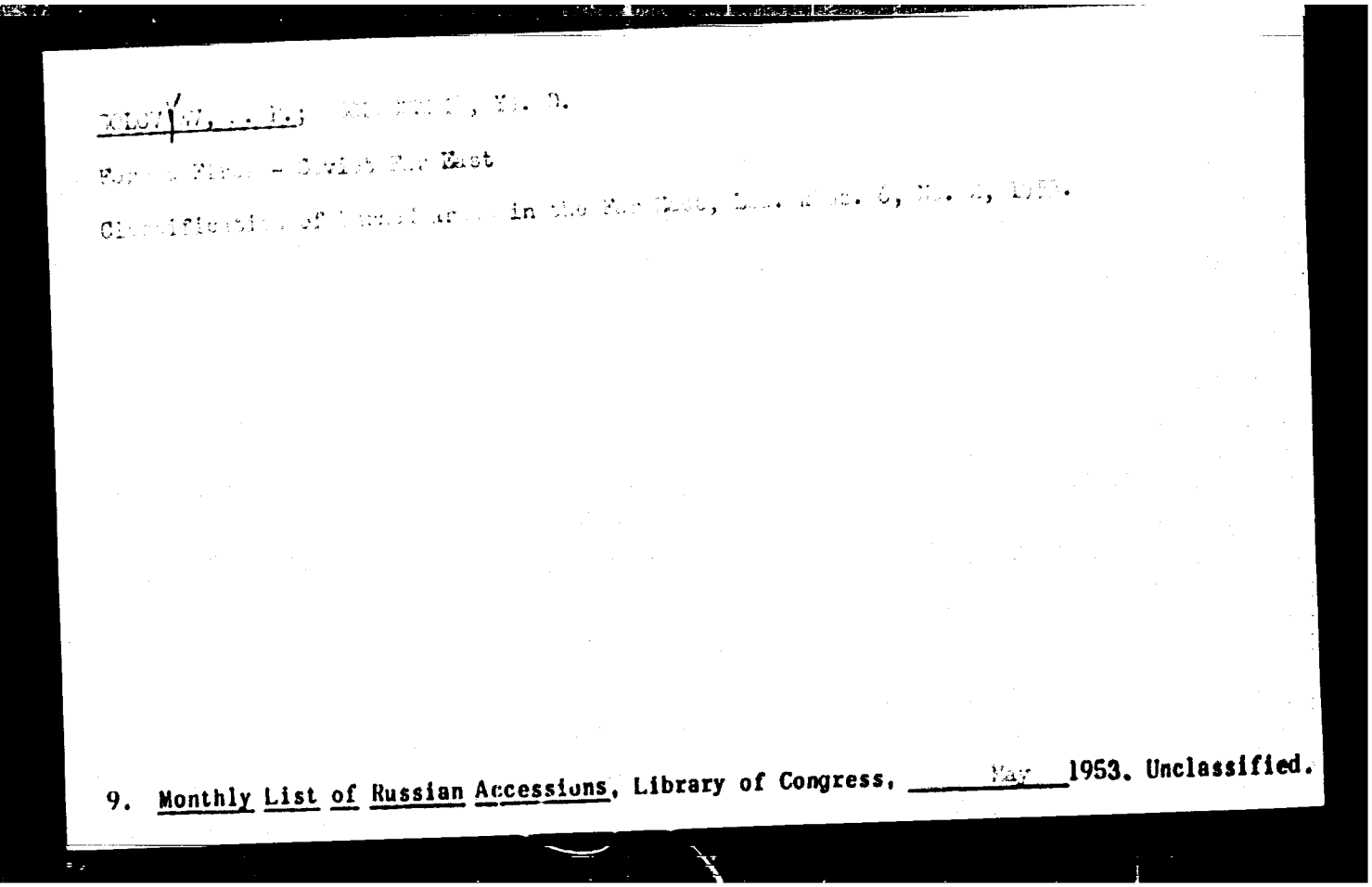
9. Monthly List of Russian Accessions, Library of Congress, [redacted] 1952 Uncl.

SOLOV'YEV, K. P. ; PROZUMENSHCHIKOVA, L. T.

Pine - Amur Province

Protect the strip of pine on the Zavitinskiy State farm. Les. i step' 4 no. 7, 1952.

Monthly List of Russian Accessions, Library of Congress, September 1952. UNCLASSIFIED.



9. Monthly List of Russian Accessions, Library of Congress, May 1953. Unclassified.

SOLOV'YEV, K.P.

Some interrelations of the pine and oak in forest-steppe regions of the European part of the U.S.S.R. (Voronezh Preserve). Biul.MOIP. Otd.biol. 59 no.2:71-78 Mr-Ap '54. (MLRA 7:6)
(Voronezh Preserve--Oak) (Oak--Voronezh Preserve)
(Voronezh Preserve--Pine) (Pine--Voronezh Preserve)

I

Country : USSR
Category: Forestry. Forest Management

Abs Jour: RZhBiol., No 11, 1958, No 48736

Author : Solov'yev, K.P.; Solodukhin, Ye. D.
Inst : -
Title : Forest Restoration on Burns in the Coniferous - Broad-Leaf Forests of the Far East.

Orig Pub: Sb. rabot po lesn. kh-vu, M -L., Goslesbumizdat, 1957, 5-12

Abstract: This article gives a classification scheme of the burns in the coniferous - broadleaf forests of the Far East. With regard to the seeding sources, the burns are divided into 2 groups, and with regard to the condition of the remains of the tree stand and the general trend in the process of re-

Card : 1/2

K-25

Country : USSR
Category: Forestry. Forest Management.

Abs Jour: RZhBiol., No 11, 1958, No 48736

tural renewal, three types were separated within each group. Along with taking stock of the groups and types, a number of measures are recommended directed toward the improvement of the sanitary conditions of the remaining tree stands on the burns and toward the generation of the destryed tree stands with predominant coniferous and deciduous species. -- V.V. Protopopov

Card : 2/2

USSR / Forestry. Forest Management. K

Abs Jour: Ref Zhur-Biol., No 7, 1958, 29569.

Author : Solov'yev, K. P.
Inst : Far Eastern Scientific Research Institute for Forestry.
Title : On Measures of Helping Along the Natural Renewal of Korean Cedar.
(O merakh sodeystviya yestestyennomu vozobnovleniyu kedra koreyskogo).

Orig Pub: Byul. nauchno-tekhn. inform. Dal'nevost. n.-i. in-ta lesn. kh-va, 1957, No 3, 19-21.

Abstract: No abstract.

Card 1/1 58

SOLOV'YEV, K.P.

Topographical location of forests with cedars and broad-leaved trees. Vop.geog.Dal'.Vost.no.3:69-76 '57. (MIRA 10:12)
(Soviet Far East--Cedar) (Forests and forestry)

SOLOV'YEV, K.P.; TSYMEK, A.A.

An unsuccessful article. Vop.geog.Dal'.Vost.no.3:77-84 '57.
(MIRA 10:12)
(Soviet Far East--Trees)

SOLOV'YEV, Konstantin Petrovich; TSYMEK, A.A., red.

[Mixed Siberian pine and hardwood forests in the Far East and their management] Kedrovo-shirokolistvennye lesa Dal'nego Vostoka i khoziaistvo v nikh. Khabarovsk, Khabarovskoe knizhnoe izd-vo, 1958. 364 p. (MIRA 12:11)

(Soviet Far East--Forests and forestry)

S/194/61/000/008/020/092
D201/D304

AUTHOR: Solov'yev, L.

TITLE: Silver chloride electrode in a ceramic casing for use with the ЭМИТ (EMIT)

PERIODICAL: Referativnyy zhurnal. Avtomatika i radioelektronika, no. 8, 1961, 17, abstract 8 V145 (Tr. in-ta okeanol AN SSSR, 1960, 39, 85-88)

TEXT: The technology of preparing the electrode (E) and its casing for the electromagnetic ocean current meters is discussed. The casing is made of chemically pure aluminum oxide. The electrode consists of a silver ribbon or grid, electrolytically coated with a layer of silver chloride. The main advantage of such an electrode is its extended storage time. The characteristics of the electrode are as follows: Zero drift ± 0.17 mV/hr, temperature coefficient 0.43 mV/degree, resistance 800-1500 ohms. 2 figures. 3 references. [Abstracter's note: Complete translation]

Card 1/1

PANIN, V.Ye.; FADIN, V.P.; SOLOV'YEV, L.A.

Investigating the ordering phenomena in Cu-Al alloys. Fiz. met. i metalloved. 13 no.2:219-224 F '62. (MIRA 15:3)

1. Sibirskiy fiziko-tekhnicheskiy institut.
(Copper-aluminum alloys—Metallography) (Solubility)

L 39399-65 EPR/EWT(m)/EWP(b)/T/EWA(d)/EWP(w)/EWP(t) Ps-4 IJP(c) JD GS

ACCESSION NR: AT4046214 S/0000/63/000/000/0032/0039

AUTHOR: Panin, V. Ye.; Zenkova, E. K.; Solov'yev, L. A.; Fadin, V. P.

TITLE: High-temperature anomalies of the properties of Cu-Al alloys in the solid solution region

SOURCE: Yubileynaya konferentsiya po fiziko-khimicheskomu analizu. Novosibirsk, 1960. Fiziko-khimicheskiy analiz (Physicochemical analysis); trudy konferentsii. Novosibirsk, Izd-vo Sib. otd. AN SSSR, 1963, 32-39

TOPIC TAGS: solid solution, solid solution transition, activation energy, vacancy mobility, copper alloy, aluminum alloy, high temperature anomaly, alloy physical property, alloy crystal structure

ABSTRACT: Earlier studies showed (see, e.g., C. R. Houska, B. L. Averbach, J. Appl. Phys., v. 30, no. 10, 1959, p. 1525; V. S. Kagan, V. A. Semenkov, Ya. S. Umanskiy, Kristallografiya, v. 5, no. 4, 1960) that solid Cu-Al solutions may undergo high temperature transitions accompanied by thermal effects and anomalous variations in heat capacity, electrical resistivity, and mechanical properties of the alloy. The present study investigated these anomalies in detail for solid

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L 39399-65

ACCESSION NR: AT4046214

Cu-Al solutions of varying concentration. Special attention was paid to solutions near the solubility limit because of the possible abrupt changes in the concentration limits. Tests using very pure (from 99.95% pure Cu and 99.99% pure Al) and technically pure alloys heated up to 800C showed that: 1) the anomalous changes at increased temperatures in the properties of solid Cu-Al solutions are caused neither by impurities nor by changes in the limits of solubility of Al in Cu; they are rather connected with the ordering processes within the alloy; 2) in alloys close to the solubility limit the ordering process may be supplemented by another process connected with the changes in the solubility limit for T<400C; 3) the kinetics of the ordering processes within the Cu-Al alloys depend, however, very much on the purity of the alloy; an increase in purity shifts the ordering process into the lower temperature region. The associated decrease in activation energy is probably related to the increased mobility of the excess hardening vacancies which, otherwise, become bound by the impurity atoms. Orig. art. has: 3 figures and 1 table.

ASSOCIATION: None

SUBMITTED: 10Sep63 ENCL: 00 SUB CODE: MM

NO REF SOV: 007 OTHER: 010

Card 2/2

SOLOV'YEV, L.D.

ATLASOV, I.P.; DEMOKIDOV, K.K.; DIBNER, V.D.; EGIAZAROV, B.Kh.; IVANOVA, A.M.; LOBANOV, M.F.; MARKOV, F.G.; RABKIN, M.I.; RAVICH, M.G.; SAKS, V.N.; SOKOLOV, V.N.; TKACHENKO, B.V.; USTRITSKIY, V.I.; NALIVKIN, D.V., nauchnyy red.; VASIL'YEV, R.P., red.; SOLOV'YEV, L.D., red.; NEKHOROSHEV, A.P., red.; DOLGONOS, L.G., tekhn. red.

[Geological map of the Soviet Arctic] Geologicheskaia karta Sovetskoi Arktiki. Sost. I.P.Atlasov [i dr.] Glav. red. F.G. Markov. ....Nauchn. red. D.V. Nalivkin. [Moskva] 1957. ..Col. map 89 x 131 cm. no. 4 sheets 51 x 72 cm. .. Scale 1:2,500,000. ..Inset: [Geological map of Wrangel Island] Geologicheskaia karta Ostrova Vrangelia, 1:1,500,000. (MIRA 11:8)

(Arctic regions--Geology--Maps)
(Wrangel Island--Geology--Maps)

SOLOV'EV, L. D.

SUBJECT USSR / PHYSICS CARD 1 / 2 PA - 1246
AUTHOR SOLOV'EV, L. D.
TITLE The Infrared Asymptotic Behavior of GREEN'S Function of the Electron, determined with an Accuracy of up to $e^4$
PERIODICAL Dokl Akad Nauk, 110, fasc. 2, 203-206 (1956)
Issued: 11 / 1956

This asymptotic behavior is here computed with the renormalization group. At first the equations of the renormalization group for the GREEN'S functions corresponding to an arbitrarily gauged electromagnetic field $A_\mu = \alpha_\mu + \omega \partial f / \partial x^\mu$ are written down. Next, representations of the GREEN'S functions $\mathcal{G}$ and G as well as equations for the infrared asymptotic behaviors are given. At $\xi \to 0$ ($m^2 - p^2 \to 0$) the series of the perturbation theory has no sense for the function S. If, however, $m^2 - p^2 \to 0$ is measured in units of $m^2 - \lambda^2 \to 0$, it is not possible to leave the domain $\xi \sim 1$ (within which the consecutive terms of this series diminish considerably). Therefore the aforementioned equation for the infrared characteristic reduces determination of the asymptotic behavior of the function s to the usual perturbational computation of the asymptotic form of the function S. On this occasion only the zero-th term of the series development of $d(z,1,e'^2)$ with respect to $(z-1)$ makes a contribution to asymptotic behavior. Further computation is carried out for $d_1(p) = d_1 = \text{const}$. On the occasion of transition to the experimental charge $e^2$ and $\omega^2 = 1$ the

Dokl Akad Nauk, 110, fasc 2, 203-206 (1956) CARD 2/2 PA - 1546

function $d(p^2/m^2, e^2)$, which is normalized for the computation of S at $p^2=0$, must be used.

The asymptotic form of the function $S(\int u, e^2, d_1) = 0$ is computed on the basis of the perturbation theory up to $e^4$. For the sum of all diagrams of the self-energy of the electron which are normalized to the experimental mass m of the electron the following expression applies at $p^2=m^2$ with an accuracy up to $e^4$: $\sum = \sum^{(2)}, \sum^{(2)} / (\hat{p} - m) \sum^{(2)}, \sum_1^{(4)} - \sum_2^{(4)} - \sum_3^{(4)}$ Also the FEYNMAN diagraphs corresponding to this expression are given. Next, the terms occurring in this expression are individually mentioned and discussed in short. The expression obtained with their help for $S(\int u, e^2, d_1)$ is explicitly written down. Finally, $G(p) = i((\hat{p}+m)/(p^2-m^2))(1 - p^2/m^2)^{-\alpha(e^2)}$ is found for the asymptotic behavior of GREEN'S function of the electron, and here it is true with an accuracy of up to $e^4$ that $\alpha(e^2) = (e^2/2\pi)(3 - d_1)/4\pi - \ldots e^2/4\pi = 1/137$. Thus, a term of the order $e^4$ is lacking in $\alpha(e^2)$.

INSTITUTION: Moscow State University "M V LOMONOSOV"

SOLOV'YEV, L. D. , LOGUNOV, A. A. and TAVKHELIDZE, A. N.

"Photoproduction Processes and Dispersion Relations," Nuclear Physics, Vol. 4, No. 3, 1957 (North Holland Publishing Co. - Amsterdam)

Abstract: Dispersion relations for photoproduction of $\pi$ - mesons on nucleons are obtained. The role of "bound states" is duscussed in connection with an analysis of the unobservable energy region. The matrix structure of the photoproduction amplitude is considered. The dispersion relations are presented in a form convenient for phase shift analysis. (received 25 Mar 57)

Joint Inst. of Nuclear Research, Lab of Theoretical Physics, Dubna USSR
(for Logunov and Tavkhelidze)

Moscow State University (for Solov'yev, L. D.)

The authors express their appreciation to Academician N. N. Bogolyubov whose investigations and attention prompted ~~mx im~~ them to carry out this work and also to B. V. Medved'yev Shirkov, D. V. and B. M. Stepanov for discussions.

APPROVED FOR RELEASE: 08/25/2000 CIA-RDP86-00513R001652310017-5"

SOLOV'YEV, L.D.

AUTHOR: Solov'yev, L.D. 56-3-42/59

TITLE: The Dispersion Relations of S- and P-Waves of the Reaction of the Photoproduction of Mesons in First Approximation with Respect to 1/m (Dispersionnyye sootnosheniya dlya S- i P-voln reaktsii fotorozhdeniya mezonov v pervom priblishenii po 1/m) (Letter to the Editor)

PERIODICAL: Zhurnal Eksperim. i Teoret. Fiziki, 1957, Vol. 33, Nr 3 (9), pp. 801 - 803 (USSR)

ABSTRACT: The matrix element of the R-matrix of transition corresponding to the photoproduction of a meson by a nucleon can be written down in the form

$$\langle \pi | R | \gamma | = -\frac{i(2\pi)^4}{\sqrt{4k^0 q^0}} \delta(p_1 + q - p - k) \sum_{i=1}^{4} (\delta_{\beta 3} A_i^{(1)} + \tau_\beta A_i^{(2)} + 1/2 [\tau_\beta, \tau_3] A_i^{(3)}) \eta_i .$$

Here k, q, p and $p_1$ respectively denote the momenta of the photon, meson, the initially existing and the resulting nucleon. The $\eta_i$ here describe the spin operators; their shape in the center of mass system is given. The $A_i(\lambda)$ as functions of W satisfy certain dispersion relations given here. Within the domain of the not observable

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AF-42/59

The Dispersion Relations of S- and P-Waves of the Reaction of the Photoproduction of Mesons in First Approximation with Respect to $f/\omega$

ASSOCIATION: Moscow State University
(Moskovskiy Gosudarstvennyy universitet)

SUBMITTED: June 14, 1957

AVAILABLE: Library of Congress

Card 3/3

21(1),24(7)

AUTHORS: Kukin, V.D., Solov'yev, L.D., and Frenkin, A.R. SOV/155-58-3-31/37

TITLE: Approximate Equations for Virtual Photoproduction (Priblizhennyye uravneniya dlya virtual'nogo fotorozhdeniya)

PERIODICAL: Nauchnyye doklady vysshey shkoly. Fiziko-matematicheskiye nauki, 1958, Nr 3, pp 169-177 (USSR)

ABSTRACT: In the paper of Logunov and Solov'yev [Ref 1] the dispersion of an electron at a nucleon with the production of a $\pi$-meson ($N+e \rightarrow N+e+\pi$) is considered. In the lowest approximation (with respect to e) it concerns the emission of a virtual photon the interaction of which with the nucleon leads to the production of the meson. In [Ref 1] this kind of interaction is denoted as a virtual photoproduction. Dispersion relations for the amplitude of the process are obtained in [Ref 1]. In the present paper, by phase investigations the authors obtain approximate equations from these relations. At first the dispersion relations in the system of the center of mass are written. Here especially the region of small energies and the S- and P-meson waves are considered ($m \rightarrow \infty$ in the dispersion relations). The restriction to finitely many waves permits (as in the case of real photoproduction) partially to overcome the difficulties combined with

Card 1/2

~~21(1)~~ 24.6000

AUTHORS: Logunov, A.A., Solov'yev, L.D.

SOV/155-58-4-34/34

TITLE: Dispersion Relations for Virtual Photo Generation (Dispersionnyye sootnosheniya dlya virtual'nogo fotorozhdeniya)

PERIODICAL: Nauchnyye doklady vysshey shkoly. Fiziko-matematicheskiye nauki, 1958, Nr 4, pp 217 - 225 (USSR)

ABSTRACT: The authors consider the dispersion of an electron at a nucleon with generation of a $\pi$ - meson ($N + e \rightarrow N + e + \pi$). Approximately it concerns the radiation of a photon by an electron, whereby the interaction of the photon with the nucleon leads to the generation of the meson. The process is denoted as virtual photo generation. Dispersion relations for the amplitude of the process are obtained. It is assumed that for high energies the amplitude is constant as a function of the energy. The assumption leads to the occurrence of (in general) undetermined constants in the dispersion relations. By the postulate of gradient invariance, however, these constants can be uniquely expressed by integrals of the imaginary part of the amplitude. The relativistic spin structures for the amplitude can be chosen so that the dispersion relations in the relativistically invariant form do

Card 1/2

[illegible], . .

"Photoproduction of Mesons on Nucleons: Phase Shift Analysis and Dispersion Relations," Nuclear Physics, Vol. [illegible], No. 1, Jan '58 (North Holland Publ. Co. Amsterdam) 256-270

Moscow State Univ.

Abst: A phase shift analysis of the dispersion relations obtained in ref. 1/ for photo-production of mesons is carried out. It is assumed that the integrals in the dispersion relations converge with sufficient rapidity.
The dependence of the photoproduction amplitude on the spin and isobaric variables and also the relation between the photoproduction and scattering amplitudes which follows from the unitary condition are considered. The range of unobservable angles, $\cos\vartheta < -1$, in the dispersion relations is examined in the c.m.s.

Phase shift analysis of the photoproduction amplitude is investigated and dispersion relations for partial waves have been obtained on the assumption of rapid convergence of the integrals. In this case the equations for S and P waves have been completely determined in the first approximation differing from the static one (that is, to terms of the order of $\mu/m$).

24 (5)

AUTHORS: Solov'yev, L. D., Tentyukova, G. N. SOV/56-37-3-61/62

TITLE: Numerical Solution of the Statistical Dispersion Relations of the P-Wave of Photoproduction

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 37, Nr 3(9), pp 889 - 890 (USSR)

ABSTRACT: The authors found the exact numerical solutions of the statistical dispersion relations for the P-amplitudes of photoproduction (taken from references 1,2). Work was carried out on the basis of the method of the reduction of linear singular integral equations to regular Fredholm equations (cf. Muskhelishvili, Ref 4), which was suggested by Omnes. Transition from the singular equations to regular ones occurs at the following conditions: The dispersion phases near the threshold and in infinity tend towards zero; the solution of the regular equation is finite and in infinity it has the same value as the solution of the singular one. For the phases the values obtained from the statistical equations of Chew and Low were taken, the solutions of which were obtained by G. and F. Salzman, and which were also computed by Tentyukova on the "Strela" computer. The regular equations for photoproduction were ob-

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tained by the method of successive approximation on the computor "Ural" at the OIYaI. Some conclusions resulting from the solution are discussed. Thus, it was found among other things that the electric dipole amplitude does not depend in static approximation on the magnetic moments. The results are compared with those of the experiments by using measuring results of the differential cross sections in the range of 160 - 260 Mev (Refs 7,8), $dq(\gamma p \to \pi^0 p)/d\Omega = A + B\cos\Theta + C\cos^2\Theta$. In the diagram $C/q^4 \cdot 10^4$ is plotted as the ordinate and $E_{\gamma lab}$ as the abscissa; C is measured in the units $(\hbar/\mu_0 c)^2$ and the meson momenta q, in the c.m.s., in the units $\mu_0 c^2$; $q^0 = \sqrt{1 + q^2}$. The curve traced out in full corresponds to the exact solution, the dotted curve to the approximated solution of reference 1, and also the experimental measuring points are plotted (near threshold). It was found that the exact solution describes the measured values much better than the approximated solution, but the curve of the exact solution has a steeper slant than

the measured values. The authors finally thank A. A. Logunov, S. V. Fomin, and N. N. Govorun for their interest, A. M. Baldin for discussions and for placing his paper at their disposal before it was published. There are 1 figure and 8 references, 3 of which are Soviet.

ASSOCIATION: Ob"yedinennyy institut yadernykh issledovaniy (Joint Institute of Nuclear Research)

SUBMITTED: June 29, 1959

SOLOV'EV, L. D., Cand Phys-Math Sci -- (diss) "Study of the processes of electro- and photo-production by means of dispersion relations." /Moscow, 1960/. 15 pp; (Academy of Sciences USSR, Mathematics Inst im V. A. Steklov, Department of Theoretical Physics); 160 copies; price not given; printed on duplicating machine; bibliography on pp 14-15 (24 entries); (KL, 17-60, 140)

SOLOV'YEV, L. D.

"Photoproduction of Pions on pions"

paper presented at the International Conference on High Energy Physics, Rochester,N.Y. and/or Berkly California, 25 Aug - 16 Sep 1960.

SOLOV'YEV, L.D.; CHEN JUNG-MO

On phenomenological account of pion-pion interaction. Dubna, Ob"e-
dinennyy in-t iadernykh issl., 1961. 22 p. (MIRA 14:11)
(No subject heading)

SOLOV'YEV, L.D.; CHEN JUNG-MO

Application of the differential method for obtaining the photo-production amplitude from dispersion relations. Dubna, Ob"edinennyi in-t iadernykh issledovanii, 1961. 26 p. (MIRA 14:11)
(No subject heading)

S/056/61/040/002/031/047
B102/B201

AUTHOR: Solov'yev, L. D.

TITLE: Photoproduction of pions on pions

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 40, no. 2, 1961, 597-604

TEXT: A study of the $\pi\pi$ interaction in Mandelstam representation always involves a study of the $\gamma + \pi \to \pi + \pi$ reaction. This process is essentially correlated with baryons in intermediate states and must be represented by graphs exhibiting a nucleon- or a nucleon hyperon loop (Fig. 1). It is shown here that the theory of dispersion relations allows obtaining the same results for this process as does the perturbation theory. The process has been already studied by M. M. Gourdin and A. Martin (Nuovo Cim. 16, 78, 1960) with the aid of double dispersion relations. They obtained a homogeneous equation for the amplitudes of the process and a pion-resonance approximate solution which does not appear to stand to reason from the physical viewpoint. The author of the present paper proceeds from the ordinary, one-dimensional dispersion

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relation in the observable region, by assuming it to be valid without subtraction. Physical considerations show that if dispersion relations with one subtraction hold for scattering, dispersion relations without any subtraction must hold for photoproduction, due to the gradient invariance. To make the dispersion relation yield an inhomogeneous equation with a non-zero solution, one must take account of the far singularities, above all those corresponding to the nucleon-antinucleon pair in an intermediate state in the unitarity condition. The one-dimensional dispersion relation for the process considered

$$F(s,t) = \frac{1}{\pi} \int_{4\mu^2}^{\infty} \frac{\mathrm{Im}\, F(s',t)}{s'-s-i\varepsilon} + (s \longrightarrow \bar{s}) \quad (10)$$ is, by elimination of the non-observable region, transformed into

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$$F\left(s, \cos\vartheta = \frac{q}{k}\right) = \frac{1}{\pi}\int_{4\mu^2}^{\infty} \frac{(\operatorname{Im} F(s', \cos\vartheta = q'/k'))_{\pi\pi}}{s' - s}\, ds'$$

$$+ \frac{1}{\pi}\int_{4m^2}^{\infty} \frac{(\operatorname{Im} F(s', \cos\vartheta = q'/k'))_{N\bar{N}}}{s' - s}\, ds' + \left(s \to \bar{s} : \frac{5}{2}\mu^2 - s\right); \qquad (13) \qquad (13)$$

(The term $(\mathrm{ImF})_{\pi\pi}$ in (10) contains a region of non-observable angles at low energies); $\mathrm{Im}\, F = (\mathrm{ImF})_{\pi\pi} + (\mathrm{ImF})_{N\bar{N}}$ ; m - nucleon mass, $\mu$ - pion mass, q and k - pion and photon momentum, respectively, $s = (q_2 + q_3)^2$, $\bar{s} = (q_1 - q_3)^2$; (the subscripts of q hold for the three pions of the process. $\varepsilon$ is an antisymmetrical tensor. Eq.. (13) is transformed, for the case of low energies (restriction to the lowest partial waves), to the form

$$f(\nu) = A + \frac{1}{\pi}\int_{0}^{\infty} \operatorname{Im} f(\nu')\left(\frac{1}{\nu' - \nu - i\varepsilon} + \frac{1}{\nu' + \nu + \nu_0}\right) d\nu'. \qquad (\ldots)$$

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$$\Lambda = \frac{2}{\pi}\int_{4m^2}^{\infty} \frac{(\operatorname{Im} F(s', 1))_{N\bar{N}}}{s'}\, ds', \qquad (16) \qquad (16)$$

$$f(\nu) = |f(\nu)|\, e^{i\delta(\nu)}, \quad \delta \equiv \delta_1^1. \qquad (17) \qquad (17)$$

($\nu = q^2/\mu^2$; f - P-wave amplitude), and then led to an exact solution, namely 1) if for $\nu \to \infty$

$$\delta(\nu) \to 0 \qquad (\delta(\nu) \to c\nu^{-\alpha},\ \alpha > 0).$$

$$\Delta(z) = \frac{1}{\pi}\int_0^{\infty} \delta(\nu)\left(\frac{1}{\nu - z} + \frac{1}{\nu + z + \nu_0}\right) d\nu.$$

holds, one obtains: $f(\nu) = \exp\{\rho(\nu) + i\delta(\nu)\}$, and 2) if for $\nu \to \infty$

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$$\delta(\nu) \to \pi, \quad (\delta(\nu) - \pi = c\nu^{-\alpha}, \alpha > 0). \tag{27}$$

$$\Delta(z) = \frac{z + 9/16}{\pi} \int_0^\infty \frac{\delta(\nu)}{\nu + 9/16} \left( \frac{1}{\nu - z} - \frac{1}{\nu + z + 9/16} \right) d\nu. \tag{28}$$

holds, one obtains

$$f^{(1)}(\nu) = \Lambda A^{-1} (\nu + 9/16)^2 \exp(\rho(\nu) + i\delta(\nu)), \tag{31}$$

$$\rho(\nu) = \frac{\nu + 9/16}{\pi} P \int_0^\infty \frac{\delta(x)}{x + 9/16} \left( \frac{1}{x - \nu} - \frac{1}{x + \nu + 9/16} \right) dx, \tag{32}$$

$$A = [\nu^2 \rho + i\delta]_{\nu=\infty}. \tag{33}$$

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This solution is only then unique if $C\alpha_0 = -\Delta\alpha$ in infinity tends to $\Delta$ like $1/\nu^4$. C = constant. With the amplitudes of photoproduction for the two models of pion resonance

$$\text{I. } \delta = \begin{cases} 0, & \nu < \nu_h - b, \quad \nu > \nu_h + b \\ (\pi/2b)(\nu + b - \nu_h), & \nu_h - b < \nu < \nu_h \\ (\pi/2b)(\nu_h + b - \nu), & \nu_h < \nu < \nu_h + b \end{cases} \qquad (43)$$

one obtains (44) and (45)

$$f(\nu) = \Lambda e^{i\delta(\nu)}\varphi(\nu), \qquad (44)$$

$$\varphi(\nu) = \left\{ \left| \frac{(\nu - \nu_h)^2}{(\nu + b - \nu_h)(\nu_h + b - \nu)} \right|^{(\nu - \nu_h)/2b} \left| \frac{\nu_h + b - \nu}{\nu + b - \nu_h} \right|^{1/2} \right\} \cdot (\nu \to -\nu - {}^9/_8).$$

$$\text{II. } \delta = \begin{cases} 0, & \nu < \nu_h - b \\ (\pi/2b)(\nu + b - \nu_h), & \nu_h - b < \nu < \nu_h + b \\ \pi, & \nu_h + b < \nu \end{cases} . \qquad (45)$$

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or

$$f(\nu) = \Lambda e^{\delta(\nu)}\varphi(\nu),$$
$$\varphi(\nu) = [(\nu_k - \nu)(\nu_k + \nu + {}^{9}/_{8}) + b^2/3] \times \qquad (46)$$
$$\times \left[\left\{\frac{e}{|\nu_k + b - \nu|}\left|\frac{\nu_k + b - \nu}{\nu_k - b - \nu}\right|^{(\nu+b-\nu_k)/2b}\right\} \cdot (\nu \to -\nu - {}^{7}/_{8})\right].$$

(46),

respectively. These phases and solutions are presented in Figs. 2 and 3 for the resonance parameters $\nu_k = 1.5$, $b = 0.4$. G. Byalkovskiy, A. Yurevich, P. S. Isayev, and M. I. Shirokov are finally thanked for discussions. There are 3 figures and 9 references: 3 Soviet-bloc and 6 non-Soviet-bloc.

ASSOCIATION: Ob"yedinennyy institut yadernykh issledovaniy (Joint Institute of Nuclear Research)

SUBMITTED: August 13, 1960

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S/056/61/040/002/031/047
B102/B201

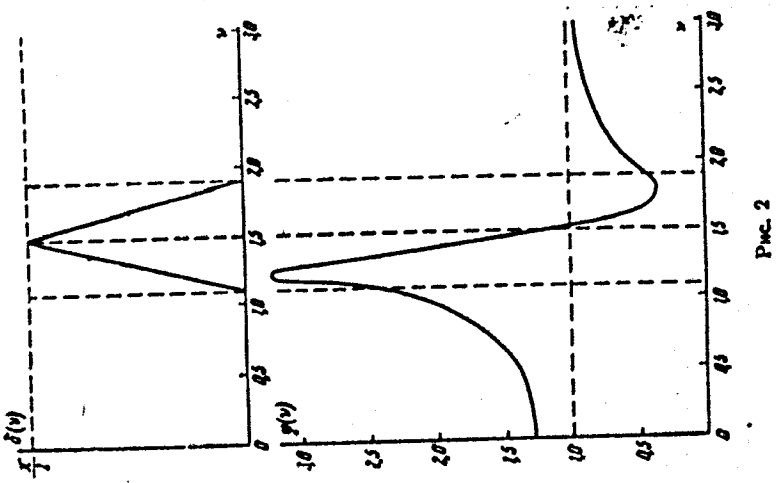

Рис. 2

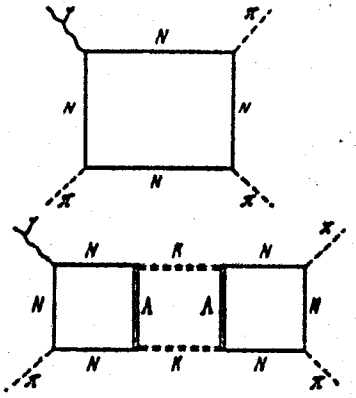


Рис. 1

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S/056/61/040/002/031/047
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Photoproduction of pions on pions

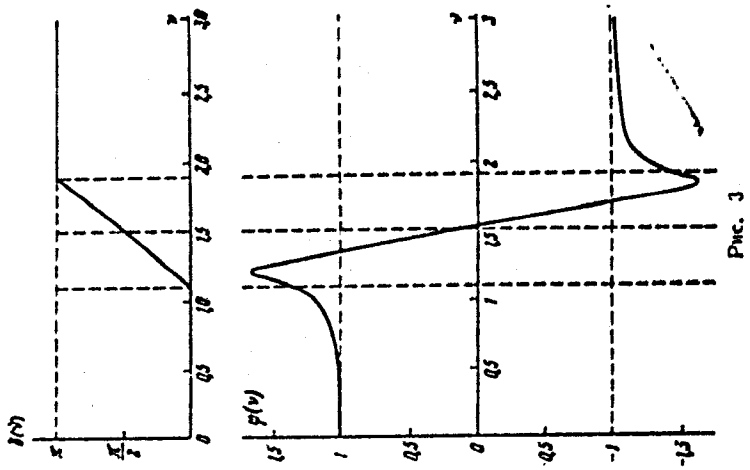

Рис. 3

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22136

S/056/61/040/003/016/031
B102/B205

24.6900 (1138, 1191, 1559)

AUTHORS: Solov'yev, L. D., Bialkowski, C., Jurewicz, A.

TITLE: Equations for the photoproduction of pions on nucleons accounting for pion-pion interaction

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 40, no. 3, 1961, 839-847

TEXT: Equations for the partial pion photoproduction amplitudes at small energies have been derived on the strength of the Mandelstam representation in Cini-Fubini approximation and with regard to nucleon recoil and pion-pion interaction. The pion-pion interaction is introduced into the equations by pion-pion photoproduction amplitudes formulated in an earlier paper (Solov'yev, ZhETF, 40, 597, 1961). Pion-pion interaction makes a contribution only to isotope-scalar photoproduction amplitudes. As a consequence, pion-pion resonance in states with J=l (if these exist at all) yields a contribution only to those amplitudes to which no contribution is made by pion-nucleon resonance. The amplitude of photoproduction on pions depends on the high-energy singularities. In the

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expression for the former there appears a parameter that depends on the amplitudes of the processes $\gamma\pi \to N\bar{N}$ and $\pi\pi \to N\bar{N}$ in the region considered. This makes it possible to write formally a system of equations relating the amplitudes of the processes $\gamma N \to \pi N$ and $\gamma\pi \to N\bar{N}$ to the $\pi N$ and $\pi\pi$ amplitudes. This system contains no new parameters. For the time being it is, however, not possible to take high energy contributions into consideration, and data on the processes $\gamma\pi \to N\bar{N}$ and $\pi\pi \to N\bar{N}$ must be taken from experiments. Thus, equations are considered here only for the amplitudes of the process $\gamma N \to \pi N$, into which the experimentally determined parameter of the process $\gamma\pi \to \pi\pi$ enters. The formulation of these equations requires a discussion of the extensive kinematics and the unitarity condition for the processes $\gamma N \to \pi N$ and $\gamma\pi \to N\bar{N}$, which is presented in the second part of the present paper. The kinematics of the former has been investigated repeatedly, and that of the latter is treated by a method of Jacob and Wick (Ann.Phys.,7,404,1959). In the second part, the spectral representation according to Mandelstam for the invariant amplitudes of photoproduction is written first.

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$$H_l^{(\alpha)}(s, s, t) = \left(B_l^{(\alpha)} - \frac{2eg^2 h_{l1}}{t-\mu^2}\right)\left(\frac{1}{s-m^2} \pm \frac{1}{s-m^2}\right) + \qquad (32)$$

$$+ \frac{1}{\pi^2}\int_{(m+\mu)^2}^{\infty} dx \int_{4\mu^2}^{\infty} dy \left(\frac{1}{x-s} \pm \frac{1}{x-s}\right)\frac{h_{l1}^{(\alpha)}(x, y)}{y-t} + \frac{1}{\pi^2}\iint_{(m+\mu)^2}^{\infty} dx\, dy \frac{h_{l3}^{(\alpha)}(x, y)}{(x-s)(y-s)} .$$

$$h_{l3}^{(\alpha)}(x, y) = \pm h_{l3}^{(\alpha)}(y, x). \qquad (33)$$

$$B_1^{(\alpha)} = 0, \quad B_2^{(\alpha)} = B_3^{(\alpha)} = \frac{g}{2}\begin{cases}\mu_p' - \mu_n, & \alpha = 1\\ \mu_p' + \mu_n, & \alpha = 2\\ \mu_p' - \mu_n, & \alpha = 3\end{cases} \qquad (34).$$

$$B_4^{(\alpha)} = -\frac{1}{4} eg - mB_2^{(\alpha)}$$

This representation is supposed to be valid without any subtraction. Confining themselves to the low-energy range, neglecting the amplitudes F, H, etc., and making use of the Cini-Fubini approximation, the authors obtained this representation in the following way:

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Equations for the photoproduction...

$H_i^{(\alpha)}(s,\bar{s},t)$ = Born term + $\frac{1}{\pi}\int_{(m+\mu)^2}^{\infty} dx \left(\frac{1}{x-s} \pm \frac{1}{x-\bar{s}}\right) a_i^{(\alpha)}(x,t) + \delta_{\alpha 2} \frac{l+1}{2\pi} \int_{4\mu^2}^{\infty} \frac{b_i(x)dx}{x-t}$

(35), where $a_i^{(\alpha)}$ = Im $H_i^{(\alpha)}$ for $\gamma N \to \pi N$ and $\delta_{\alpha 2}\, b_i$ = Im $H_i^{(\alpha)}$ for $\gamma\pi \to N\bar{N}$. $a_i^{(\alpha)}(s,t)$ corresponds only to a pion-nucleon intermediate state in the unitarity condition. The singularity with respect to t begins at $16\mu^2$ and can be expanded in a Taylor series. When neglecting the phases D, F, etc. of pion-nucleon scattering, this expansion reads $a_i^{(\alpha)}(s,t) = a_{i0}^{(\alpha)}(s) + (t-t_0)a_{i1}^{(\alpha)}(s)$. In order that $a_i^{(\alpha)}(s,t)$ contains no unobserved angles, $t_0$ is replaced by the threshold: $t_0 = \mu^2 - 2qk_{thresh}$, $k_{thresh} = \mu(2m+\mu)/2(m+\mu)$. Substituting (35) in

$$M_{l\pm} = C\int_{-1}^{1} dx \frac{1}{2} A_{l\pm}\left[\frac{q(W-m)}{2}\frac{(1-x^2)P_l'(x)}{l(l+1)} H_1 + \right. \qquad (17)$$

$$\left. + \left\{\frac{W+m}{2W}(W+E_2+qx)\left[P_l(x) - \frac{q(W-m)P_{l\pm1}(x)}{(E_2+m)(W+m)}\right] + q\frac{(1-x^2)P_l'(x)}{l(l+1)}\right\} H_2 + \right.$$

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$$+\left\{\frac{W+m}{2W}(\omega-qx)\left[P_l(x)-\frac{q(W-m)P_{l\pm1}(x)}{(E_2+m)(W+m)}\right]-q\frac{(1-x^2)P_l'(x)}{l(l+1)}\right\}H_3+$$

$$+2\left\{P_l(x)+\frac{qP_{l\pm1}(x)}{E_2+m}\right\}H_4\Big]. \qquad (17)$$

$$E_{l\pm}=C\int_{-1}^{1}dx\frac{1}{2}B_{l\pm}\Big[\frac{q(1-x^2)_l}{2}\Big\{\frac{q(W+m)}{E_2+m}D_{l\pm}P'_{l\pm1}(x)-$$

$$-(W-m)A_{l\pm}P_l'(x)\Big\}H_1+\Big\{\frac{W+m}{2W}(W+E_2+qx)\Big[P_l(x)-$$

$$-\frac{q(W-m)P_{l\pm1}(x)}{(E_2+m)(W+m)}\Big]-q(1-x^2)\Big[A_{l\pm}P_l'(x)+D_{l\pm}\frac{qP'_{l\pm1}(x)}{E_2+m}\Big]\Big\}H_2+$$

$$+\Big\{\frac{W+m}{2W}(\omega-qx)\Big[P_l(x)-\frac{q(W-m)P_{l\pm1}(x)}{(E_2+m)(W+m)}\Big]+$$

$$+q(1-x^2)\Big[A_{l\pm}P_l'(x)+D_{l\pm}\frac{qP'_{l\pm1}(x)}{E_2+m}\Big]\Big\}H_3+2\Big\{P_l(x)+\frac{qP_{l\pm1}(x)}{E_2+m}\Big\}H_4\Big],$$

где

$$A_{l\pm}=\begin{cases}(l+1)^{-1}\\-l^{-1}\end{cases},\quad B_{l\pm}=\begin{cases}(l+1)^{-1}\\l^{-1}\end{cases},\quad D_{l\pm}=\begin{cases}(l+2)^{-1}\\(1-l)^{-1}\end{cases}.$$

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one obtains the integral equations for photoproduction. Whereas the last integral for the isotope-vectorial amplitudes vanishes only in (35), the reaction $\gamma\pi \to N\bar{N}$ makes a contribution to the isotope-scalar amplitudes. Neglecting the non-resonant $\pi N$ phases from (35), one obtains

$$H_l^{(3)}(s, \bar{s}, t) = \left(B_l^{(3)} - \frac{2\varepsilon g \delta_{l1}}{t - \mu^2}\right)\left(\frac{1}{s - m^2} \pm \frac{1}{\bar{s} - m^2}\right) + \frac{1}{\pi}\int_{4\mu^2}^{\infty} \frac{b_l(t')\,dt'}{t' - t}, \quad (44)$$

for the isotope-scalar photoproduction amplitudes; the $b_i$ are given by

$$b_1(l) = \frac{mq_1}{16\pi E p^2}\left[T_+^{(-)l} - \frac{m}{\sqrt{2}E} T_-^{(-)l}\right] f_l^*,$$

$$b_3(l) = \frac{mq_1}{16\pi p^2}\left[-\frac{m}{E} T_+^{(-)l} + \frac{1}{\sqrt{2}} T_-^{(-)l}\right] f_l^*, \quad (39).$$

$$b_2(l) = 0, \quad b_4(l) = -(mq_1/16\pi E) T_+^{(-)l} f_l^*.$$

There are 1 figure and 15 references: 6 Soviet-bloc and 9 non-Soviet-bloc. The three references to English language publications read as follows: J. L. Uretsky et al. Phys.Rev.Lett.1,12,1958; S. Mandelstam, Phys.Rev.112, 1344,1958; W. R. Frazer, J. R. Fulco Phys.Rev. 117,1603,1609, 1960.

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22136

S/056/61/040/003/016/031
B102/B205

Equations for the photoproduction...

ASSOCIATION: Ob"yedinennyy institut yadernykh issledovaniy (Joint Institute of Nuclear Research); Institute of Theoretical Physics of Warsaw University, Poland, G. Bialkowski and A. Jurewicz

SUBMITTED: September 6, 1960

Card 7/7

SOLOV'YEV, L.D.; SARANTSEVA, V.R., tekhn. red.

[Infrared singularities in electron-proton scattering]Infrakrasnye osobennosti v elektron-protonnom rasseianii. Dubna, Ob"edinennyi in-t iadernykh issledovanii, 1962. 4 p.
(MIRA 15:12)
(Electrons--Scattering) (Protons) (Infrared rays)

SOLOV'YEV, L.D.

[Dispersion relations in quantum electrodynamics] O dispersionnykh sootnosheniiakh v kvantovoi elektrodinamike. Dubna, Ob"edinennyi in-t iadernykh issledovanii, 1962. 7 p. (MIRA 16:10)

(Quantum electrodynamics)

DEMINA, N.V.; YEVTEYEV, V.L.; KOVALENKO, V.A.; SOLOV'YEV, L.D.; CHEN' TSUN-MO [Ch'en TS'ung-mo]; SARANTSEVA, V.R., tekhn. red.

[Nonobservable region in the dispersion relations for photoproduction] O nenabliudaemoi oblasti v dispersionnykh sootnosheniiakh dlia fotorozhdeniia. Dubna, Ob"edinennyi in-t iadernykh issl., 1962. 14 p. (MIRA 15:4)
(Mesons) (Wave mechanics)

S/056/62/042/002/034/055
B108/B104

AUTHORS: Solov'yev, L. D., Chien Tsʻung-mo

TITLE: Phenomenological description of pion-pion interaction

PERIODICAL: Zhurnal eksperimentalʻnoy i teoreticheskoy fiziki, v. 42, no. 2, 1962, 526 - 537

TEXT: The authors consider low-energy pion-pion interaction processes. Resonances are assumed to exist for two pions with isotopic spin 1 in the P state and for three pions with isotopic spin 0 in the P state. The processes are discussed with Feynman diagrams, under the assumption that hypothetical "bipions" and "tripions" are exchanged. These particles are respectively denoted by $B^n_a(x)$ (spatial and isotopic spins 1, mass $m_B$) and $T^P(x)$ (spatial spin 1, isotopic spin 0, mass $m_T$). The nucleon form factors $F^{S,V}_{1,2}$ are calculated. The bipion contributes only to $F^V_{1,2}$, the tripion only to $F^S_{1,2}$. Pion-nucleon scattering is considered using data from J. Bowcock et al. (Nuovo Cim., 16, 918, 1960; 19, 142, 1961) and the two-pion resonance width $\gamma = 0.376$. Discussion of the form factors of

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charged pions yielded the pion radius $\langle r^{(2)} \rangle = 0.38$ (0.53 f). Moreover, pion-pion scattering, decay of the neutral pion, photoproduction of pions on pions, and inelastic scattering of pions from nucleons is discussed. The bipion and tripion models which are equivalent to the resonance approximation in the dispersion relations are very useful in establishing connections between low-energy pion-nucleon processes. L. L. Nemenov, V. A. Meshcheryakov, P. F. Feoktistov, and Shen Ch'ung Hua are thanked for discussions and numerical calculations. There are 11 figures and 14 references: 1 Soviet and 13 non-Soviet. The four most recent references to English-language publications read as follows: N. P. Samios, Phys. Rev., 121, 275, 1961; How-sen Wong, Phys. Rev., 121, 289, 1961; R. Hofstadter et al. Phys. Rev. Lett., 6, 290, 293, 1961; J. A. Anderson et al. Phys. Rev. Lett., 6, 365, 1961.

ASSOCIATION: Ob"yedinennyy institut yadernykh issledovaniy (Joint Institute of Nuclear Research)

SUBMITTED August 12, 1961 (initially),
January 13, 1962 (after revision)

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37877
S/056/62/042/005/022/050
B102/B104

AUTHORS: Nemenov, L. L., Solov'yev, L. D., Khomskiy, D. I.

TITLE: The role of the bipion in the generation of a pion in nucleon-nucleon collisions

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 42, no. 5, 1962, 1283-1284

TEXT: Hitherto only single-meson graphs have been considered when calculating pion generation in N-N collisions (Phys. Rev., 123, 669, 1961). In this paper, the contribution of "bipion" graphs to the differential cross-section of the reaction $N + N \longrightarrow \pi + N + N$ is calculated. Attention is confined to incident nucleons of energies between 600-1500 Mev, so that the energy of the nucleon and meson in the final state lies close to the (33)-resonance energy, and therefore their interaction need only be considered in the resonant state. It follows from the law of the conservation of isotopic spin that the particles must have T = 1 in the intermediate state. For T = J = 1 and an energy of 4.7 $\mu$ ($\mu$-pion mass), two mesons are in resonant interaction, so the resonant state plays the

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dominant role in the bipion exchange discussed here. The reaction $p + p \longrightarrow \pi^+ + p + n$ is considered and the bipion contribution is calculated. Given that the incident proton is at a high energy level and is scattered through a small angle, we obtain

$$\begin{aligned} &\sqrt{2\pi}\,(\mathcal{E}+2M\mathcal{M})^2\omega\kappa^{l_0}\sin\delta_{33}/M^2q^2]\,[(p_1^0+M)(p_2^0+M)/4M^2]^{1/2}\times \\ &\times\chi^+(p_1')\,(2\,[qk]+i\,(kq)\,\sigma-i\,(\sigma k)\,q)\,\chi(p_1)\times \\ &\times\chi^+(p_2')\,\sigma\left(\frac{\sigma p_2}{p_2''+M}+\frac{\sigma p_2'}{p_2^0+M}\right)\chi(p_2)\,(m_B^2-k^2)^{-1}. \end{aligned} \qquad (3).$$

Here $p_1$ and $p_2$ are the momenta of the protons ($p_2$ is that of the target proton) q is that of the final proton, neutron and $\pi^+$ meson; $\vec{p}_1' + \vec{q} = 0$, $\omega = p_1'^0 + q^0$; M is nucleon mass, $\chi$ are two-component spinors; $f^2 = 0.08$; $m_B$ is the bipion mass; $\mathcal{E}$ and $\mathcal{M}$ stand for the isotopic-vectorial charge and the magnetic moment of the nucleon; with $(\mathcal{E} + 2M\mathcal{M})^2 = 466$, $m_B^2 = 22.4$ and a formula by Mohler (Nuovo Cim., 16,

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565, 1960) for the $\delta$-33 phase, the cross-section was calculated and compared with that for a single-meson graph. It was found that up to 2 Bev the contribution of the bipion graph does not exceed 9-10% of the contribution of a single meson. It increases monotonically with the initial energy. There is 1 figure.

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